



Whistler Design Preview

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WMI Overview and WMI features in Whistler

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Agenda

- **Windows 2000 WMI (Windows Management Instrumentation) overview**
- **New WMI features in Whistler**
- **Wrap up**

Windows Management Instrumentation

- **Goal - Make Windows the best managed OS**
- **Means - By providing comprehensive infrastructure and instrumentation data**
 - **Robust Eventing services**
 - **Consistent, extensible & discoverable schema**
 - **Query services**
 - **Scripting Interface**
 - **Based on Industry Standards**
- **Outcome**
 - **Provides business opportunities to ISVs**
 - **Provides OEMs/IHVs easy ways to**

WMI Availability

- Installed by default in Windows 2000 and Windows Millennium
- Available for Windows 95, Windows 98, Windows 98 SE and Windows NT 4 (SP4 or higher)
- End user Core & SDK download at MSDN web site
 - SDK at <http://www.microsoft.com/management/wmi>
 - Core at <http://www.microsoft.com/downloads/release.asp?ReleaseId=18490>

WMI in Win2000 today

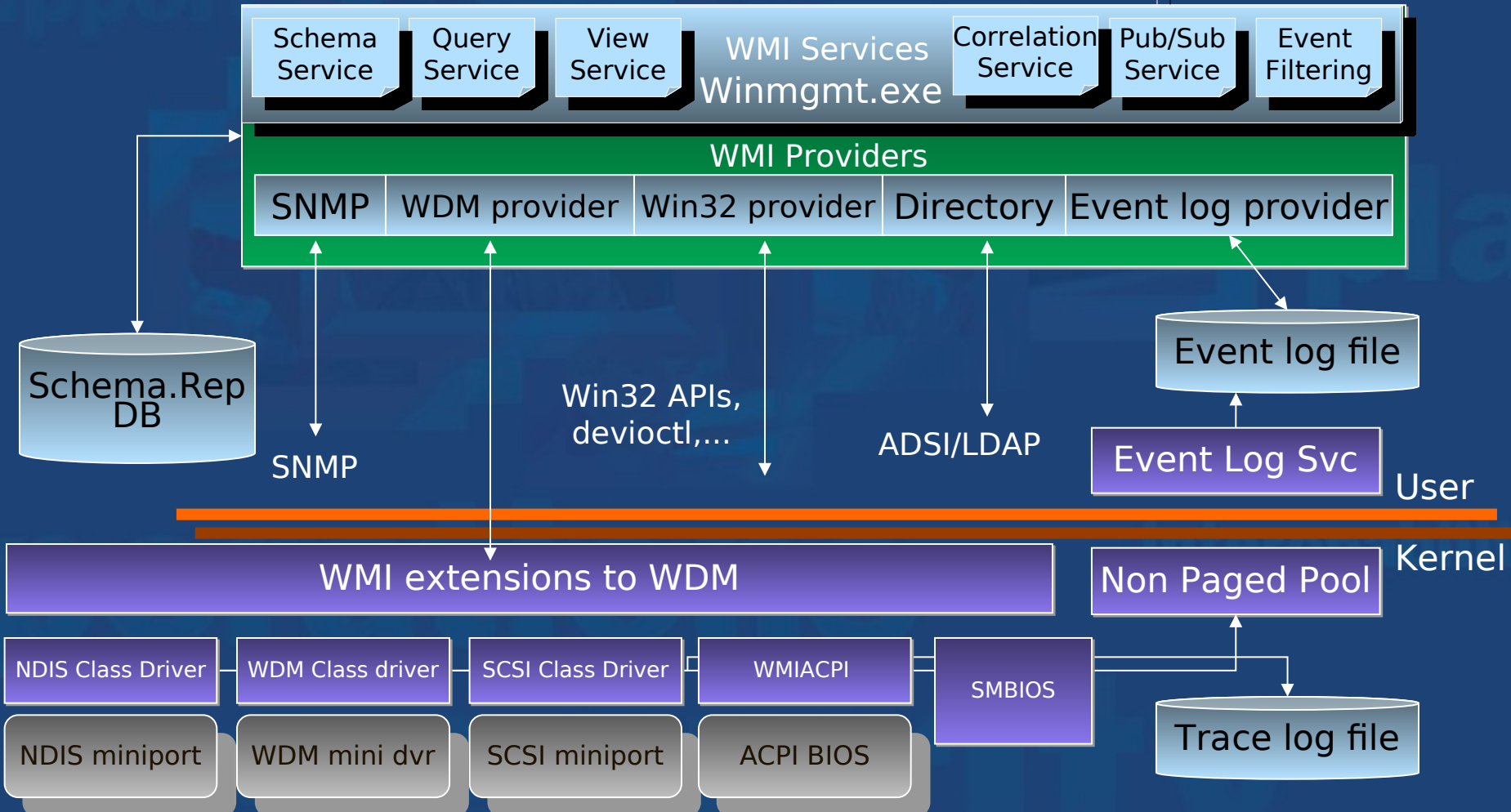
- **Eventing Services**
 - Event-Driven Mgmt / Health Monitoring
- **Query Services**
 - Query access to information
- **Schema Services**
 - Model-Based Management
 - Relationships between various aspects of Management domains
 - Extensibility of Models
 - Discoverability of Managed Objects
- **Scripting**
- **Industry-Standards Based**
- **Platform for enabling management**
 - Providing Instrumentation
 - Writing Mgmt Apps

WMI Infrastructure (Windows2000)

```
for each Service in  
  GetObject("winmgmts://foo").  
    InstancesOf ("Win32_Service")
```

```
WScript.Echo Service.DisplayName  
Next
```

DCOM



Eventing Services

- Infrastructure for Health Monitoring
- Events are objects
 - Schema for event defined & extensible using CIM
- Async and sync
- Query subscription & filtering
- Simple aggregation
 - coalesce the identical events within *specified* interval
- Integrated polling
- Event Consumers : Permanent and Temporary
- Built-in Event Consumers

Query Services

- All CIM objects are queryable

```
IWbemServices::ExecQuery  
  ("select * from Win32LogicalDisk  
   where Win32LogicalDisk.FreeSpace < 2000000")
```

- SQL subset with new terms

- Extensions for Discovery/Traversal of Schema relationships :associations, references

```
IWbemServices::ExecQuery  
  ("Associators of {Win32_Service = 'DHCP'}")
```

- Event filtering (thresholds, aggregation, inheritance)
 - **within** XXX -- for specifying the tolerance for event delay
 - **isa** -- registration applies to all events from class (incl. derived classes)
 - **within** XXX (**within** group by clause) -- specifies aggregation interval

```
select * from __InstanceModificationEvent within 5  
  where TargetInstance isa Win32_LogicalDisk  
         group by DriveLetter  
         within 10 having count > 25
```

WMI providers : Schema

Built by WMI team

- Win32
 - More than 600 classes (3000 props) for System/Network/ Apps/ Devices/...
 - and relationships between various aspects
- SNMP
- Registry
- NT Event log
- Performance Monitor
- Active Directory
- MSI
- DMI (w/ Intel)
- WMI for WDM -- Kernel instrumentation
 - SCSI Disk, IDE Disk, NDIS, Keyboard, Mouse, USB HUB

Built by other MS teams

- SMS inventory, pkg distrib, SW installs..
- SMS Healthmon
- Netmon monitors & experts
- NLB Service
- SNA Server
- Printer Mgmt (Chameleon)
- Office 2000

Providers in Progress ...

- Exchange Monitoring
- AppCenter Monitoring
- SQL Server, BizTalk Server
- IIS, Netshow, DHCP, DNS
- Cluster
- Security Trust Mgmt, Directory

Schema Services

- **Rich Object-oriented Meta-schema**
 - Classes, instances, props, methods, events, qualifiers
 - External relationship / associations
 - Provide inheritance - Schema is extensible
- **Schema RunTime - Rich/Uniform access to all WMI schema**
 - Queries / Navigation / Association / Traversal
 - Schema / Instance Manipulation
 - Method invocation
 - Events pub/sub, filtering, correlation
- **View Service**
 - Ability to define the view across multiple objects, multiple machines
- **Standard-Based**
 - DMTF

Scripting Services

- **Easy access to WMI objects**
 - Powerful tool for IT admins; example is collect BIOS serial numbers in an Excel spreadsheet
- **Flexible - script can be in wide variety of languages**
 - Visual Basic, Visual Basic for Applications, Perl, VBScript, Jscript, ASP
- **Synchronous or Asynchronous**
 - Async notifications via COM events
- **100+ script samples from live PSS**

Platform for Mgmt Apps (as of 10/99)

ISVs & OEMs	17	HP, Tivoli, CA, Compuware, Network Associates, BMC, IBM, NetIQ, Mission Critical, Tidal , Intel, Dell, Fujitsu, Toshiba...
WBEM/ WMI- shipping products	31 (Products & agents)	BMC Patrol 3.3; HP Tootools, Network Node Manager, ManageX 4.0; Tivoli IT Director, Netview; CA TNG; NetIQ App Manager; IBM Universal Mgmt; Network Associates Cybercop, Event Orchestrator; Tidal Software SysAdmiral...
IHVs	9	Intel, Compaq, Dell, IBM, Hitachi, : Motherboards, Storage devices, NetCards, ...
Internal Customers	20+	SMS, MSInfo, AppCenter, Exchange, Directory, Security, Networking, Appliances, Data Center, BizTalk, SQL Server, MSMQ,

Agenda

- **Win2000 WMI overview**
- **New Whistler WMI features**
- **Wrap up**

WMI Whistler features

- **Extend WMI to cover Enterprise scenarios:**
 - **XML/HTTP Support**
 - **Event Services features:**
 - **Correlator**
 - **Enterprise Event Log**
 - **Event Forwarding**
 - **Event Consumers**
 - **WMI & DS in the Enterprise**
 - **More Instrumentation (Providers)**
 - **Additional features**

WMI XML/HTTP support

- **XML/HTTP access for WMI objects and operations:**
 - **SNIA demo last fall**
 - **March 2000 DMTF Fusion event**
- **WMI is protocol agnostic**
 - **HTTP/XML, DCOM or MSMQ**
- **WMI Objects as XML**
 - **WMI from XML and XML from WMI**

Eventing

Services: Correlation

Event Aggregation (Win2000)

- Notify me only once when 100 Link down events occur within 5 mins
- **Event/ Time correlation**
 - Page me on all transaction-failure events except for those occurring less than 5 minutes after server shutdown
 - Tell me when my disk stays below 10M for 5 minutes
- **Event / Data correlation**
 - Notify me when CPU utilization is exceeding 90% (ignore fluctuation between low (70) and high (90) thresholds) - Raising Edge/Falling Edge events
 - Tell me if and when *all* backup controllers are down
- **Calculating state from events over time**
 - What was the trend of my queue size over the last 10 min?
 - What was the average of my queue size the last 10 min?
- **Counting and heartbeating**
 - Notify me if *no* heartbeat is received in 5 minutes

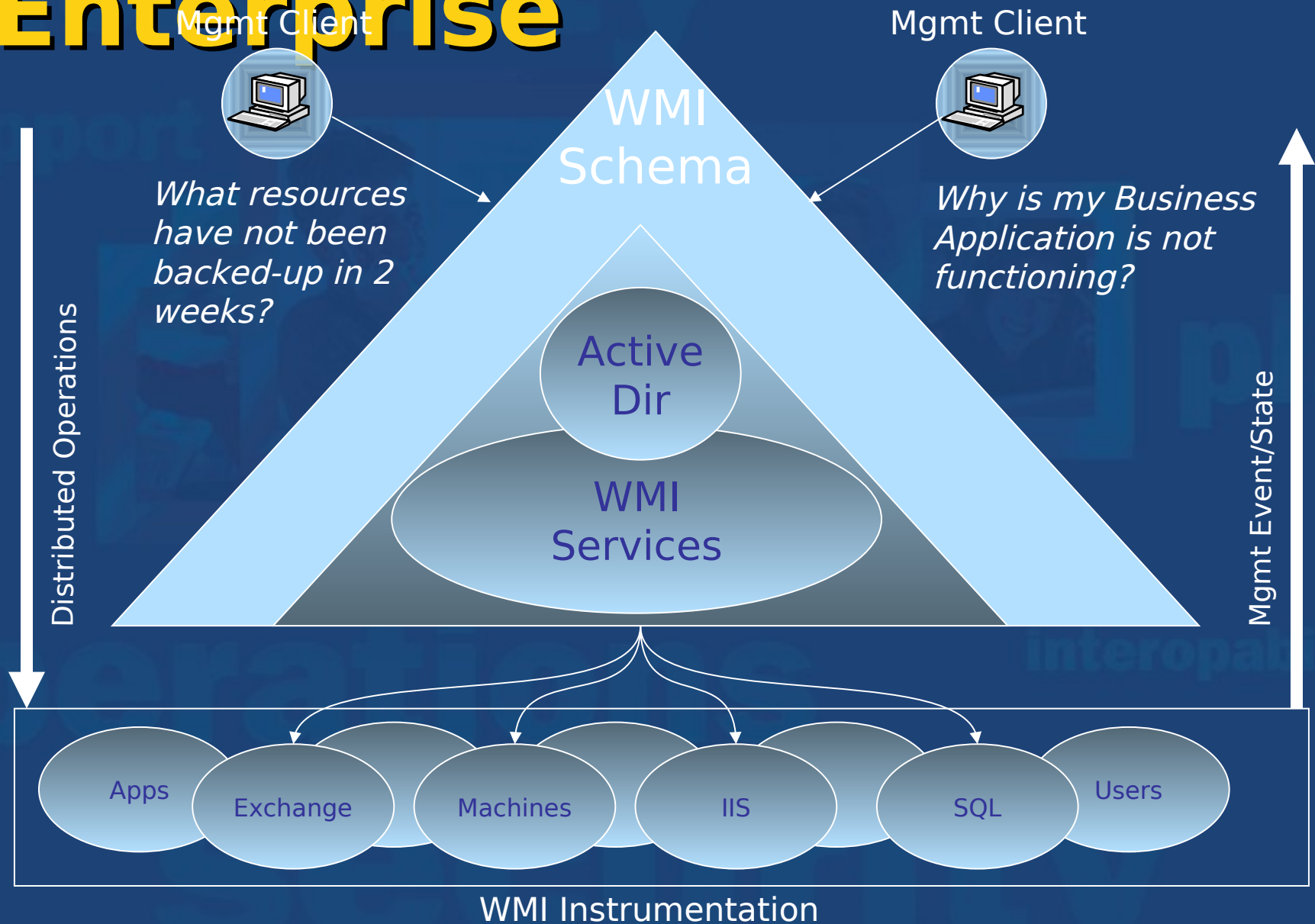
Eventing Services: Distributed

- **Enterprise Event Log – Covered in depth in next presentation**
 - Enterprise logging service for storing events from:
 - Systems, Applications, Network devices
 - Policy-based collection events, routing, storing, processing
 - Platform for building applications such as billing, auditing, SLA provisioning, health monitoring, web site analysis, performance analysis, capacity planning, and enterprise management,...
- **Event Forwarding**
 - Adding MSMQ support (in addition to DCOM)
 - Guaranteed delivery

Event Services: Event Consumers

- Consumers passed string/parameters customized with event data
- Following event consumers “out of the box”
 - Log file consumer
 - NT event log consumer
 - TAPI consumer
 - SMTP email consumer (Win2000)
 - Command line consumer

WMI & DS in the Enterprise



More WMI Instrumentation

- **data** Many Microsoft O/S groups writing providers

Chkdsk Cluster

COM+ DFS

Disk Quotas IP Route data

Ping Print subsystem

Windows Job Objects etc

- **Microsoft app teams building providers**

SQL Provider Exchange
etc

- **Feature enhancements to existing WMI providers (win32, etc)**

Additional WMI features

Policy Based Config

- **Configuring WMI-enabled objects via enterprise-wide policies**
- **Built on top of GPO infrastructure**
- **Policy Selection can be based on local conditions**
- **Used to configure Enterprise Event Log**
- **Security, Performance, & Scalability Enhancements**
- **Integration with Visual Studio 7**
 - **ATL Wizards for developing providers**
 - **Browsing WMI schema with VS server explorer**

WMI Call-to-Action

- **Use WMI for managing your enterprise**
 - Hardware vendors are instrumenting to WMI
 - Application vendors are instrumenting to WMI
 - Management app vendors are WMI-enabling their products
- **Advantages**
 - WMI Event-driven mgmt - robust, secure, distributed & scaleable filtering, aggregation and correlation of events
 - XML/HTTP standards based solution providing firewall traversal & interoperability
 - Extend mgmt solutions using WMI scripting
 - Wide range of mgmt data available - Win32, SNMP, Registry, Perfmon, NT Event Log, Directory, etc
 - Schema services - Using WMI aligns your solution with WBEM industry-standard

Additional Resources

■ WMI articles at

- <http://msdn.microsoft.com/downloads/sdks/wmi/whitepapers.asp>
- <http://www.microsoft.com/hwdev/management>
- <http://msdn.microsoft.com/library/techart/mngwmi.htm>
- Email [**wmi@microsoft.com**](mailto:wmi@microsoft.com)
- Usenet Newsgroup
 - [**microsoft.public.wbem**](mailto:microsoft.public.wbem)
- “Common Information Model:
Implementing the Object Model for

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